VANADIUM (ATOMIC ABSORPTION, DIRECT ASPIRATION)

1.0 SCOPE AND APPLICATION

1.1 See Section 1.0 of Method 7000.

2.0 SUMMARY OF METHOD

2.1 See Section 2.0 of Method 7000.

3.0 INTERFERENCES

3.1 See Section 3.0 of Method 7000 if interferences are suspected.

3.2 Background correction may be required.

3.3 High concentrations of aluminum or titanium, or the presence of Bi, Cr, Co, Fe, acetic acid, phosphoric acid, surfactants, detergents, or alkali metals, may interfere. The interference can be controlled by adding 1,000 mg/L aluminum to samples and standards.

4.0 APPARATUS AND MATERIALS

4.1 For basic apparatus, see Section 4.0 of Method 7000.

4.2 Instrument parameters (general):

4.2.1 **Vanadium hollow cathode lamp.**
4.2.2 **Wavelength:** 318.4 nm.
4.2.3 **Fuel:** Acetylene.
4.2.4 **Oxidant:** Nitrous oxide.
4.2.5 **Type of flame:** Fuel rich.
4.2.6 **Background correction:** Required.

5.0 REAGENTS

5.1 See Section 5.0 of Method 7000.

5.2 Preparation of standards:

5.2.1 **Stock solution:** Dissolve 1.7854 g of vanadium pentoxide, V_2O_5 (analytical reagent grade), in 10 mL of concentrated nitric acid and dilute to 1 liter with Type II water. Alternatively, procure a certified standard from a supplier and verify by comparison with a second standard.

5.2.2 Prepare dilutions of the stock solution to be used as calibration standards at the time of analysis. The calibration standards should be prepared using the same type of acid and at the same concentration as will result in the sample to be analyzed after processing. In addition, 2 mL of the aluminum nitrate solution described in Paragraph 5.2.3 should be added to each 100 mL of standards and samples.

5.2.3 **Aluminum nitrate solution:** Dissolve 139 g aluminum nitrate ($Al[NO_3]_3 \cdot 9H_2O$) in 150 mL Type II water; heat to complete dissolution. Allow to cool and dilute to 200 mL with Type II water. All samples and standards should contain 2 mL of this solution per 100 mL.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 See Chapter Three, Section 3.1.3, Sample Handling and Preservation.

7.0 PROCEDURE

7.1 Sample preparation: The procedures for preparation of the sample are given in Chapter Three, Section 3.2.

7.2 See Method 7000, Paragraph 7.2, Direct Aspiration.

8.0 QUALITY CONTROL

8.1 See Section 8.0 of Method 7000.

9.0 METHOD PERFORMANCE

9.1 The performance characteristics for an aqueous sample free of interferences are:

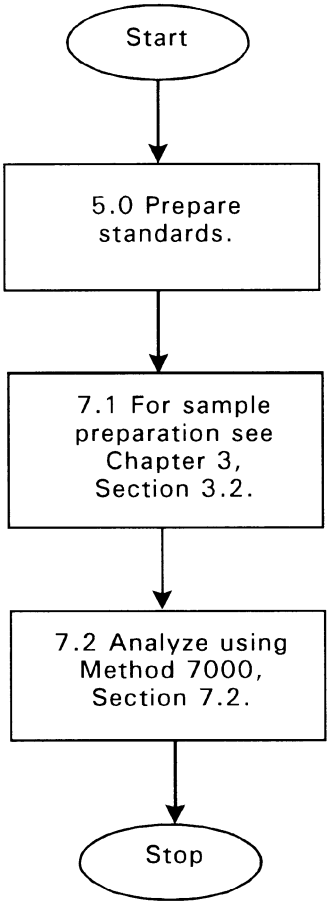
Optimum concentration range: 2-100 mg/L with a wavelength of 318.4 nm.
Sensitivity: 0.8 mg/L.
Detection limit: 0.2 mg/L.

9.2 In a single laboratory), analysis of a mixed industrial-domestic waste effluent, digested with Method 3010, at concentrations of 2, 10, and 50 mg/L gave standard deviations of ±0.1, ±0.1, and ±0.2, respectively. Recoveries at these levels were 100%, 95%, and 97%, respectively.

9.3 For concentrations of vanadium below 0.5 mg/L, the furnace technique (Method 7911) is recommended.

10.0 REFERENCES

1. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-82-055, December 1982, Method 286.1.


Start
5.0 Prepare standards.
7.1 For sample preparation see Chapter 3, Section 3.2.
7.2 Analyze using Method 7000, Section 7.2.
Stop